SUPPLEMENT.

The Mining Journal,

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No. 2492.—VOL. LIII. LONDON, SATURDAY, MAY 26, 1883. PRICE (WITH THE JOURNAL) SIXPENCE
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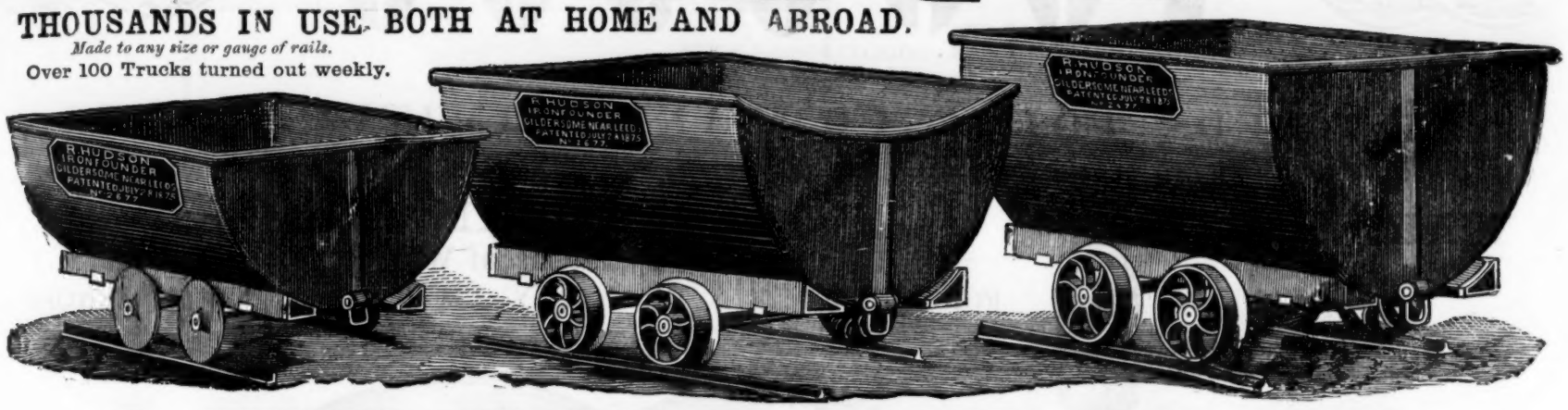

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The following Testimonials refers to this Packing:—

Sewage Works, Winchester, Jan. 12, 1883.

Mr. J. Bell, Asbestos Works, London.

DEAR SIR,—I have great pleasure in saying that the Asbestos Packing I had from you is the best I have ever used, though I have used other Asbestos Packings not of your make. As an example, one of my piston rod glands was packed with it, and has been working night and day since October 26 without re-packing. I have not been able to run so long with any other make.

I am, Sir, yours truly, J. ASHCROFT, Chief Engineer.

Mr. John Bell, Asbestos Works, London. Portsmouth, February 20, 1883.

SIR,—Your Asbestos Steam Packing that you have been supplying for some considerable time I can recommend to steam users generally as being the very best that was ever introduced into the market for piston glands, slide throttle and throttle valve glands. I can after considerable experience say that it is the very best that I have ever used. We run our engine at between 80 and 90 revolutions per minute, and I may add that there is no work more trying than saw mil work. Yours truly, WM. HATCHER,

Engineer at Bailey's Steam Saw Mills, Portsmouth.

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The Maxim Weston Electric Company (Limited), 29, Bankside, London, S.E., 4th January, 1883.

Mr. John Bell, 118, Southwark Street, S.E.

DEAR SIR,—In answer to your request, I beg to inform you that I find the thermometer placed 3 feet above the boilers now stands at 93°; before your covering was put on it used to stand at 126°. With regard to the saving in fuel I am unable to speak very accurately, as the boilers were not working long enough before being covered to ascertain the amount of fuel that would be consumed in an ordinary run; but I feel quite justified in saying that we burn less by about 5 cwts. per night than we were doing, and I shall be glad at any time to show the boilers to any one who may wish to see them, as I consider yours the best covering that I have up to the present seen.

Yours faithfully, (Signed) J. H. CUNDALL, Works Manager.

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The engineer of a world-renowned firm writes:—"There is not, nor can there be, any doubt as to the excellence of your Asbestos and Indiarubber Woven Sheeting—as a jointing material it is unrivalled."

The engineer of a large colliery writes:—"I would in all candour say that your Asbestos and Indiarubber Woven Sheeting is first-rate for joints. In my 25 years' experience I have not seen anything like it. I highly recommend it to all those who have to do with steam engines."

BELL'S ASBESTOS YARN AND SOAPSTONE PACKING,

For Locomotive Engines, Cranes, &c.

The following Testimonial refers to this packing:—

Festiniog Railway, Locomotive Superintendent's Office, Portmadoc, Jan. 13th, 1883.

Mr. John Bell, 118, Southwark-street, S.E.

DEAR SIR,—I have much pleasure in saying that the Asbestos Yarn and Soapstone Packing gives every satisfaction; indeed, better than we expected. We have a locomotive packed with it, and has been running five months (and think of the piston speed with our small wheels). I think the Soapstone a great improvement, as it keeps the packing elastic, and prevents it getting hard. I am very pleased with its working, and also the very low price for such good lasting packing. The Asbestos Yarn we find is very useful, and answers admirably.

(Signed) Yours truly, W. WILLIAMS.

BELL'S ASBESTOS ROLLED CLOTH PACKING,

For Marine Engines. Every 10 feet length of the above Packings has a label attached bearing my Trade Mark, without which none is genuine. The following Testimonial refers to the Asbestos Cloth Packing:—

S.S. "NORFOLK," S.W. India Docks, London, February 28th, 1882.

John Bell, Esq.

SIR,—I have great pleasure in reporting on your Asbestos Cloth Rope Packing which you sent me on trial. I tried it in one of two H.P. Piston Rods, and it ran 90 days without repacking. The other H.P. Piston Rod was packed with a similar form of packing, not composed of Asbestos, and was repacked 10 times during the 90 days. I have recommended it both at Sydney and Melbourne, and shall do my best to take this packing in whatever steamers I may have to do with.

I remain, Sir, yours truly,

W. W. PROPHET, Chief Engineer S.S. "NORFOLK."

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Original Correspondence.

GOLD MINING IN THE TRANSVAAL, AUSTRALIA, AND NEW ZEALAND—A STRIKING SIMILARITY.

SIR,—In reading the interesting description, lately published by the South African Syndicate, of the geological formation of the Transvaal gold fields, and also the reports of the mining engineers who had been sent out to examine these gold fields, I was forcibly struck with the, I may say, identical character of, the rock formation in which the rich gold-bearing veins are found in the Lydenburg district with that both of the Hill End district, New South Wales, and of the Thames gold fields, New Zealand. In both of these districts I have mined, and they have produced the richest stone ever found in Australia. The different engineers say with respect to the Transvaal fields that the strata of the surrounding country are metamorphic, and consist of sandstone, clay, and micaceous slate, the stratified formation being broken through in many places by the eruption of igneous rocks. Diorite dykes have thus been formed of varying thickness, in some places not exceeding 10 to 12 ft., in others extending to 100 ft., and through these there run a number of quartz veins from 1 to 12 in. thick, which according to the reports yield from 10 to 1000 ozs. of gold per ton.

In New South Wales, at Hill End, about 200 miles from Sydney, is a similar formation, concerning which I will give a few facts, some having come under my own observation, whilst others are taken from the reports of geological surveyors and mining managers.

Mr. J. J. C. Coates, civil and mining engineer, thus describes the geological formation of Hill End:—"The country for a radius of many miles round Hawkins' Hill, Hill End, consists of a series of slate beds varying in colour from light grey on the surface to light and dark blue. The whole series of strata dip to the eastward, and the strike from north to south. The characteristics thus described have been altered by an eruption of volcanic rock from below, diorites, greenstone, and a composition of hornblende and felspar; this, if we except granite, is supposed to be the most slowly cooled of volcanic rocks. This rock traverses Hawkins' Hill from north to south, and on the Thames gold fields, New Zealand, is a mass of trachite, which covers a cracked and much disturbed slate deposit, and in some instances this broken formation is traversed by diorite dykes, and almost in contact with them occurred the rich gold deposits found in the Caledonia and Golden Crown claims."

Through this formation at Hill End run a number of rich quartz veins which increase in number and richness as the sinking becomes deeper; they vary from a few inches to 3 ft. in width, some of which yielded over 2000 ozs. per ton.

In 1872, 2 tons of stone, taken from Paston's Mine at a depth of 260 ft., gave the enormous yield of 4250 ozs. of gold; ten weeks' work yielded 12,460*l.* worth of gold; the next crushing gave 28,000*l.*; the eight weeks following gave 6900*l.*

A cake of gold weighing 4250 ozs., the result above referred to of 2 tons of stone, was shown at the Joint-Stock Bank, Sydney, just as it came out of the crucible, and measured 14½ in. across and 10 in. deep.

Kroman's cake of gold, exhibited at the Sydney Intercolonial Exhibition in May, 1872, weighed 5612 ozs., and was the result of 16 tons of stone.

It is difficult to obtain a complete record of the crushings of the different companies; but the following, taken from the half-yearly reports, are a few of the extraordinary results obtained:—

Kroman's Gold Mining Co.			Carroll and Beard.			Bevers and Holterman.		
Tons.		Ozs.	Tons.		Ozs.	Tons.		Ozs.
15	...	6989	25	...	2543	273	...	15,510
185	...	8982	41½	...	5534	—	...	—
55	...	5673	56	...	3086	—	...	—

The mining manager of Carroll and Beard Company, in his report, describes the veins cut in the shaft. The first was cut at a depth of 170 ft. from the surface, and had a thickness (width?) of about 10 in. From this vein 10 tons have been taken, which yielded 4 ozs. per ton. The second vein, encountered at a depth of 190 ft., was 2 ft. 3 in. thick (wide?), and from it 23 tons have been taken out, yielding 18 ozs. per ton. The next vein was cut at a depth of 240 ft., and the 34 tons worked from it yielded 80 ozs. per ton. The total yield of the last crushing (2 tons 13 cwts.) was 799 ozs. 19 dwts.—say, over 300 ozs. per ton. Some of these mines have now been sunk to a depth of over 700 ft., and are still giving handsome returns.

The rock in which these veins occur, but especially the footwall, contains a large proportion of iron pyrites, which for some distance from the veins carries gold in payable quantities.

The figures as to the yield of the Lydenburg gold fields may to the uninitiated appear incredible, or too good to be true. The foregoing facts, however, not only show that such enormous yields are by no means unknown, but, inasmuch as the geological formation of the Lydenburg district, is so remarkably similar to that where the above results have been actually achieved, as may be easily verified, one might have predicted—from that point of view alone, and even if none had been found to support the assertion—that gold would there exist to a similar extent.

The reports of the engineers, however, made after actual examination of the land seem to leave no doubt that the Lydenburg gold fields will not only rival, but probably eclipse those of Australia.

JAMES MURPHY, M.E.

DIAMOND FIELDS COLLIERIES COMPANY.

SIR,—Referring to Dr. Matthews's letter in last week's *Mining Journal*, authority was given, I am informed, for the use of his name by another member of the local committee, who, by telegram, confirmed all the names on the local committee as published in the prospectus.

J. H. COX,
Chairman Diamond Fields Collieries Company (Limited).

Broad-street Buildings, May 21.

SOUTH AUSTRALIAN COPPER MINES.

SIR,—The directors of this company considered on April 5, 1882, that "they had every reason to believe that during the current year" the Blinman and the Mount Rose Mines would be "in full work, and making profitable returns." The report now issued informs us that our subscribed capital is all but exhausted; but the only profit at present made by any shareholders is that divided as directors' fees. The London expenses up to 1882 were 1465*l.* 1s. 9d., and up to 1883, 1735*l.* 4s. additional. In cases like this, where mines are managed by a paid colonial committee, and where consequently the London board are probably not overworked, might it not be a graceful act if the directors waived (say) half of their fees until such time as the anticipations of their prospectus had been realised.

Clarges-street, May 24. SHAREHOLDER.

COLORADO UNITED MINES.

SIR,—The shareholders of these mines have received three circulars during the past week—one from the directors asking for their confidence and support; the other two from Mr. Archibald J. Smyth, and they will now have to decide between the board and Mr. Smyth, and there should not be any difficulty in doing so, for it does not concern the board alone, but also Mr. Hamill, the manager of the mine in Colorado, as if Mr. Smyth carries his point the resignation or dismissal of that gentleman would follow as a matter of course. This, I consider, the most important point in the whole matter. To those who have read his very able and exhaustive statement of Feb. 2, I need scarcely recapitulate the state of affairs when he succeeded to the management of a mine which had been worked for the Stock Exchange, and left with worn out machinery and a debt of $50,000, all of which had to be paid. Mr. Hamill advanced for that purpose $30,000, for which he charged no interest in a district where the rate rules high, gave his services for 22 months without payment, and has brought the mine again free of liabilities to a dividend-paying condition. I think the shareholders should pause before they take any steps by which they might lose his valuable services. I would recommend my brother shareholders to read his statement carefully, and leave Colorado in the hands of a body of gentlemen who attend to their duties and do not speculate in the shares, and who I doubt not will receive the confidence and support which they deserve, and which will be an encouragement to every honest director in all time coming.—*Upper Norwood, May 22.* COSMOPOLITAN.

COLORADO UNITED MINING COMPANY.

SIR,—Out of the midst of the grossest official darkness, and the direst mismanagement, comes the welcome news of the cutting of the Oneida Fenton lode in the West Terrible tunnel; to use Mr. Hamill's own words: "The cross-cut has encountered an exceedingly fine lode, carrying high grade ore." It may not be generally known that this is the largest lode upon the mountain, and that I have been looking forward for weeks past to the cutting of the same. I now hear on good authority it is from 10 to 15 ft. wide, soft as putty, full of fine-grained galena carrying silver, and that they will have to timber the whole thing. These are the words of my informant, which implies that we have found a deposit at this point. This Fenton lode forms a triangle with the Terrible lode, whose base is the West Terrible tunnel.

In view of the meeting on Monday next, where doubtless I shall be allowed but little time to explain a few facts which have come to my knowledge with reference to the Terrible lode itself, which is 3000 ft. eastward of the above-mentioned discovery, I take this opportunity to say that the shaft has been sunk over 1300 ft. upon the lode, which is as wide in the bottom as the whole width of the shaft—say, 14 ft.—all of which is concentrating ore, and is sent to the mill. Going east from the shaft 30 to 40 ft. in, there is a porphyry dyke 6 to 8 ft. thick, which intrudes itself through the lode, on the other side of which still going eastward the lode has made solid mineral from 6 to 10 in. thick, and in some cases even 18 in. Many times of late has ore been cobbed at surface over a foot in bulk. This porphyry dyke I prize most highly, as it has intruded into the lode from the 9th level downwards. I will simply say in one word that it makes the mine, whether it be a cross-course or a dyke; we all know that beyond this is found the stuff. This dyke is maintaining its downward course equi-distant from the shaft.

The reserves in the mine may be summed up as follows, and I state that 18 months' hard working will not exhaust them:—The 13th level driven 300 ft. in ore the whole way, and varying from 5 to 10 in.; assay 500 to 1000 ozs. per ton—all intact. The 12th level: Nos. 2 and 3 stopes only partially standing. In the several levels above this point there are many pillars of ore left beside stulls hardly touched—to wit, in the 8th, east of shaft, full of the richest ore. The 9th, west of shaft, not run 11th, only partially run. The 12th not touched. Besides which there are many stulls in the Brown and Coin that have never been run through the mill. In consequence of the ignorance met with by those connected with this commercial undertaking I have thought it necessary to send you this letter, hoping that you will give the fullest publicity to the same.

ARCHIBALD J. SMYTH.

THE CHILE GOLD MINING COMPANY.

SIR,—The attention of the proprietors of the Nacupai Mine has been called to the report in last week's Journal of the general meeting of shareholders of the above company held at the City Terminus Hotel on Thursday last, when Mr. John Harvey, the Chairman, is reported to have made the following remarks:—

"During the past year the board in the interest of the company considered it advisable to obtain an adjoining property called Austin No. 9 that bounds our property to the north, and though possibly not of much value to any other company or owner, on account of the absence of water and the small area, it was of importance to us, as it enabled us to commence the additional shafts necessary for working our property to advantage on the lode instead of sinking shafts through hard and unproductive ground. I hope that the extension of our property will prove remunerative and valuable to this company."

With reference to the alleged purchase of concession No. 9 we are instructed to inform you that a correspondence has recently taken place between us on behalf of the Nacupai proprietors and the directors of the Chile Company, by which we informed the directors of the Chile Company that the property was vested in the nominees of the Nacupai proprietors and stood registered in their names at Bolivar. Also that the title had been approved by the most eminent advocate at Bolivar and that the deed of transfer had been duly registered with all the formalities required by Venezuelan law, and we warned the company against allowing their manager, Mr. Nicholson, to negociate for the purchase of the said concession.

We submit that after the warning that the Chile directors received from us and in the face of the legal proceedings now pending they ought not to have put the matter as they did at the meeting without even alluding to the correspondence above referred to.

London, May 24. JOHN TAYLOR AND SONS.

CHILE GOLD MINES.

SIR,—There appears to be something mysteriously wrong connected with the management of this mine. Here are directors who will countenance such a heavy expenditure at the mines without enlightening the shareholders as to its cause. We were informed that Mr. Nicholson soon after his arrival at the mine estimated that the sum of 2800*l.* per month would be amply sufficient expenditure, yet we now find the monthly expenditure nearly double. Now, Sir, one is led to ask what this means, and what are our directors about? Have they thoroughly practicable mining men to represent them on the spot? I, for one, should imagine that directors of mining companies before this would have profited from the severe lessons so often taught them of late concerning the necessity of care in selecting men to manage mines or to be their consulting engineer. Your correspondent, in last week's Journal, intimated that we are to expect something good from under the present management, and I hope it may be so. We all know the result so far, and if we be again dissappointed it is to be hoped the directors of all the gold mines in that district will in future be careful to employ from this country, whether managers or consulting engineers, none but known practical and reliable men, so that we may have more dividends, fewer calls, the precious metal returned at a cheaper rate, and that the Chairman of directors will be relieved of unnecessary responsibility.—*Stoke Newington, May 24.* J. W.

FOREIGN MINING ENTERPRISE—CAUSES OF FAILURE.

SIR,—Since my return to Europe, after a long residence on the gold fields of Queensland, Australia, I have been much struck with the immense losses that have been incurred by the public in gold mining, the losses arising in far greater proportion from incompetency of the managers than any inherent poverty in the mines themselves. I am an old practical gold miner and nothing more, claiming no inspired knowledge, and too practical to point out a defect without suggesting the remedy, which will be efficacious if efficaciously followed up, as it is simple. In procuring a mine agent or manager, having provisionally elected those whose testimonials appear most satisfactory, instruct some respectable person in the various localities where the applicants have held office to make stringent personal enquires, the delay incurred thereby will be apparent only, and eventually end in saving much time and more money.—*May 25.* J. B. R.

RETIREMENT OF MR. ROBERT HUNT, F.R.S.

SIR,—The perusal of the *Mining Journal* of May 19 caused me a pang of regret to learn that we are to lose the services of Mr. Robert Hunt. Without doubt, he has silently and unostentatiously rendered more aid to the mining community than most are aware of, and I sincerely wish to lend my humble testimony to Mr. Hunt's worth as far as lies in my power. We recognise the work he has done in secret, and are anxious to show our appreciation in a substantial form. Let it be universal, and I would suggest that some gentleman or gentlemen of position should be appointed to receive what I hope will prove a substantial recognition of the great things that Mr. Hunt has done. That such a light in the mining world should leave us without the possibility of its radiance helping us on with words of encouragement and advice would be too great a blow. We will listen still in the hope that though retired from public life, we shall continue to receive counsel from one who has grown old in the service, whose voice will cheer in the darkest hour. We thank Mr. W. Niness for introducing the matter to our notice, and trust with him that England will show her appreciation of long and useful labour.

Peak Great Consols. JAMES BARKER, Foreman Dresser.

HORNACHOS MINING COMPANY.

SIR,—I was glad to see Mr. Symons's letter in last week's Journal. I can fully endorse what he states. Circulars have been sent out to the shareholders promising forthcoming dividends, &c. No wonder the shareholders should question the integrity and capacity of the management. A strict investigation is called for. A. S. T.

Sheffield, May 22.

CABLE TRAMWAYS, AND MINE DEVELOPMENT.

SIR,—In connection with the development of mines the complaint is frequently heard that but for the difficulty of transport of ores from the mines and materials to it profits would be easily realisable. The remedy proposed is usually a railway, but as this involves an outlay far larger than most mining companies are able to bear the mine is permitted to languish and die. Being a pretty considerable holder of shares in the Corporation of South Australian Copper Mines this transport question has been pressed more strongly upon my attention, for I learn from our energetic resident director—Mr. T. A. Masey—who is temporarily in this country, that although our best mines are but 20 miles from the railway the cost of carrying the ore over that 20 miles are almost as much as for the entire remainder of the carriage to Adelaide. It would, no doubt, be a good thing—a first rate thing, indeed—to have a railway over this 20 miles, but how are we to get it seeing that we have a comparatively small proportion of our shares subscribed for, and require all the money we can get for the development of our mines, which as far as I can learn are equal for contents of rich ore to any in Australia. But money alone is not the sole obstacle to the construction of a railway; we must have surveys made, the line graded, and various other work to be done for which we have neither men nor paraphernalia in the shape of Government sanctions and the like which would be required if money were sought from those accustomed to embark in railway enterprise.

Tramways, supposing that locomotive or horse traction is to be used, would have all the same disadvantages; but I am inclined to think that cable tramways would not offer any such obstacles, as they could take the ground up hill and down hill as it comes, and a few stationary engines judiciously placed in positions where water and fuel are readily obtainable would furnish all the motive power required. If cable tramways were determined upon it would probably be worth the while of our directors to ascertain the merits of a system recently introduced in Missouri by Mr. S. H. Terry, of Guthrie, as it seems to be at once simple and economic. The essential feature of the improvement consists in forming cross-ties with the main tube; in providing the tube with enlargements or pockets, so that large bearing or anti-friction wheels may be used with a small tube; in providing the horizontal bearing wheels with a device for retaining the cable in position; in providing the main tube at the pockets, or near the vertical bearing wheels with inclines for lifting the gripper, or easing it over the vertical bearing wheels; in providing the tube with a side pipe or passage for conveying the water around the box, and in some other minor details. The main tube is made of cast-iron, and is formed with cross-ties attached, which not only form the supports for the stringers of the track but also for the tube itself. Instead of casting the cross-ties with the tube they may be made separate therefrom in two parts and be bolted to the tube, or they may be flexibly connected with the said tube. The tube is provided with strengthening flanges or ribs, which may be placed as frequently as desired, and their number should be somewhat in accordance with the thickness of the main plate, which thickness for ordinary purposes will be about ⅜ in. This tube is made in sections, and one end may be reduced in size to fit a corresponding socket on the end of the adjoining section, or both ends may be reduced in size and fitted into a corresponding but separate socket, or the said ends may be secured by providing them with flanges, which can be bolted together, with or without intervening packing material.

Alternate sections, or as many sections as may be needed for that purpose, are provided with depressions or pockets for the purpose of inserting large vertical anti-friction bearing wheels. Whenever it is desirable to run a cable rapidly, small bearing wheels cannot be used, as their motion becomes so rapid that they wear quickly, and are liable to heat. Their situation also is such that they are not easy of access, and running as they do, where dirt and dust is always liable to accumulate or settle, this difficulty is a serious one. He avoids it by the use of the said pockets, which enable him to insert bearing wheels 2 or 3 ft. in diameter, so that the cable may have a travel of 6 or 9 ft. to each revolution of the said bearing wheels, and thereby allow the cable much greater speed with a small or ordinary-sized tube than has heretofore been practicable. These vertical bearing wheels are supported in the said pockets preferably on non-rotating hollow axles, as they are less liable to accumulate dirt, and are much more easily lubricated, for, by extending one end upwards, oil can be applied without opening a man-hole covering or door, so that the said door is only required to be opened when changes or repairs are necessary. The hollow axles are provided with small or fine perforations, when oil is used for the lubricant; if, however, heavy oils or tallow are to be used, then they are made somewhat larger, but still not large enough to pass the lubricant too easily. The perforations are also used for the horizontal wheel axles, and their position is such that sufficient oil or lubricating material will flow down and lubricate the lower shoulder or bearing. These axles may also be projected upwards, so that they may be oiled through the opening at the top of the main tube.

Whenever a curve in the main tube becomes necessary, as at junctions, the bearing wheels are placed horizontally. In this case the bearing wheel pockets extend horizontally, and the wheels are provided near their upper edges with a groove to hold and carry the cable when in its ordinary travel, but as the gripper lifts the cable out from the groove, and is liable to lift it away from the wheel, Mr. Terry provides these horizontal bearing wheels with guide plates, which are attached to the wheel axles, and are formed with two prongs or projections. When the gripper comes against one of these projections it is so inclined as to turn the plate back and bring the opposite projections out over the cable, and as the gripper passes away from the wheel it strikes the other projection and thereby throws the first one back again over the cable, so that it is impossible for the gripper to lift the cable away from the bearing wheel, while at the same time it readily passes the bearing wheel in its travel. The wheel pockets may be provided with openings for the escape of any water that may accumulate therein while the cable is not in motion; the ordinary movement of the cable gives the bearing wheels a sufficient movement to throw any water out of the pockets. The cross-ties are provided with sockets for holding the stringers in place, but they may be left with inner shoulders, and the stringers may be bolted down if desired.

The bars of the main tube from the boundaries for the opening or passage into the tube through which the gripper passes, and by their use a smooth finished boundary is given to the groove or opening by making them of wrought-iron they are less liable to be chipped or broken by the passage of heavy teams over or across them than they would be if made of cast-iron. The said bars are bolted or rivetted on, and may be made to lap joints with the casting or not, as desired for when bolted on they may be made longer than the cast-iron sections. In turning a curve the cable passes from wheel to wheel in a straight line. Great difficulty has been experienced in gripping on a curve when the gripper has been released by stopping, which was frequently necessary in order to avoid collisions. He obviates this difficulty by projecting the horizontal bearing wheels somewhat beyond the tube slit or opening, and by providing the interior of the tube on its longest side with the guide. This guide may be an interior plate, when the form of the tube is preserved, or it may be made in the tube itself.

By this construction and arrangement and the use of a yielding or

jointed gripper the cable can be grasped at any point along the cable, except at a bearing wheel, the guide plate guides the gripper to the cable, and by carrying the bearing wheels beyond the opening the effect of the tendency of the cable to run in a straight line is divided between the two sides of the slit or opening. For large or easy curves it will not be necessary to project the bearing wheels across the opening, but it is important in short curves. Where heavy T or other strong rails are used stringers may not be necessary, and in that case all that will be required will be to place some wooden plank ends or blocks in the openings to avoid undue solidity of the structure, it is obvious that in dispensing with the stringers the outer ends of the ties will be made higher, so as to give the sails their proper position, and when stringers are used blocks may be placed with their grain vertical between the ends of the stringer sections, which will prevent any settling or bending of the rail at the points of junction in the timber, and when stringers are not used the openings may be formed into suitable chairs to hold the rail, or may be made large enough to admit of the insertion of wrought-iron or other suitable chairs. If the gripper should inadvertently be released on a curve when against one of the horizontal bearing wheels or under the plate thereon, he prevents the gripper from being drawn up so that it cannot be again applied, and also so that it will not throw the cable off from the wheel, by providing the main tube with ledges or shoulders. With some form of grippers one of the ledges or stops will be sufficient, in other forms it will be desirable to use both.

Now I need scarcely say that the principal item of cost in one of these cable tramways would be the tubes and pockets, next to these would come the wheels and the fixing of them, and lastly the ordinary tramway rails, but the advantage of avoiding all cutting and filling are so enormous that I confidently believe the system would be worth a trial.—*City, May* 21. OMBRA.

ROCK-DRILLS—THEIR RELATIVE MERITS.

SIR,—We did not consider it any great joke to speak of the hardness of the heads of Cornishmen, having looked upon it as a simple matter of fact; but as Messrs. Holman Bros. are positive about it, and they are on the spot, we must accept their dictum. They say also they can conceive those heads coming into use as mining rams if there were no better machines than ours. In view of this statement of theirs, we can now better understand what brilliant ideas concerning the progress of the future are ensconced in the brains of those native leaders who think to revolutionise the mining industries of Cornwall by the use of the Cornish drill—their main hope doubtless resting upon their having baptised it "Cornish."

Messrs. Holman Bros. are not satisfied with our machines. Of course they are not. Yet they say they "no doubt did good service in their day and generation" Just here is where a great joke comes in, for the idea of any good machine of any kind applicable to mining having had its day and generation in Cornwall within the short period of 16 years—the Cornish people being left to their own inclinations and initiative—is simply preposterous, and particularly so as relating to boring machinery. So far as our experience goes boring machinery, ours at least (if we charge our present machinery with the expenditure of every kind that has preceded), is an instrument to which much has been given, and from which, as we have found out, much is required, and we do not see why Messrs. Holman Bros., or any other correspondent, should try to reverse the generally understood rule that time, thought, and experience; patience, perseverance, and expenditure of money, bring inventions to maturity and perfection. Messrs. Holman Bros. "think there are other machines from which better speed can be obtained." We have repeatedly shown one of our machines working at 1200 strokes per minute, with 6½ atmospheres pressure, and that our largest size of machine will continue working until the pressure is reduced to one-half atmostphere.

As to Mr. McCulloch's remarks, we can state that the contractor of the St. Gothard Tunnel was abundantly satisfied with any machine that could stand the usage and remain in the tunnel day and night for a month without coming out for repairs. If our opinion were asked, we should feel confident in stating that the Cornish drill would not have stood the usage for 24 hours, nor have performed more than a quarter to a third of the work, no matter how many of them were put in work simultaneously. But, as the most difficult offset to Mr. McCulloch's statement, we refer him to a letter from Sir George Denys, Bart., in the *Mining Journal* of Dec. 27, 1873, in which he states:—

> Facts are better than theories or opinions. The MacKean drill working in my level has been in use a little over six months. During that time it has only been once to the surface, and the repairs have cost about 3s. The only signs of wear are in the brasses at the top and bottom of the cylinder, which causes a little unsteadiness in working; these can, however, be replaced at a trifling cost when required. During the last four weeks, working only during the daytime, from 6 A.M. to 6 P.M., we have cut 10 fms. of ground, at the rate of 5*l.* 10*s.* per fathom. As the men pay for their own candles, dynamite, and drawing the work out, this includes every charge except oil, cleaning the machine, and part of a smith's wages—together about 1*l.* per week. It will be allowed that this is good work. We thought so, and gave the men 5*s.* extra per fathom in consequence. The width of the level is about 5 ft., and the average height at least 7 ft. The charge for dynamite was 13*l.*

The machine Sir G. Denys refers to was 38 in. in length over all, including 1 ft. of feed, and 6 by 8 in. in general cross section, and the weight of the machine was 143 lbs. We have also a private letter from him, dated Dec. 26, 1870, in which he says:—"We have not yet used either of the new machines; have been working for last eight months with one of old ones, with new feed box, and have not had a single stoppage. The ground has been irregularly hard, as bad as could be."

Messrs. Holman Bros. have probably spent some cash which they do not find returning, and they perhaps discover that they have put too much faith in a ten minutes' trial. Your correspondent "H." writes with an impression of conviction in his mind as to the truth of all he states, but in our opinion he is considerable off the track. In requiring 12 to 30 ft. to angle even the longest of all drills, he might as well require 12 to 30 in. to angle his toothpick. Four or six of our St. Gothard type of drills are more easily angled in a gallery of 6, 7, or 8 ft. width than even one of the smallest of our own or any other system on a column or stretcher, as it is done mechanically by the turning of adjusting screws.

Paris, May 23. MACKEAN AND CO.

LORDS' DUES.

SIR,—It must be pleasing to a great number of persons to see that this question has been so heartily taken up by the Mining Institute of Cornwall, and thousands will be grateful to that, or any other institution or individuals that may be the means of removing the heavy burdens in the form of dues that in these depressed times so cripple and, in many instances, destroy this class of the nation's industry. As far as I have yet seen in the discussions that have taken place on this subject the question has been confined almost exclusively to the relation between the landlord and the lessees, or mine proprietors, whereas the matter has a far wider scope, affecting 10 times the number of persons. Were it a question affecting those persons alone, important as it is it would be insignificant indeed compared with the question when taken in its broadest and fullest sense and viewed in all its bearings on society. The rights of the landlord should be considered from a two-fold point of view—the legal and the moral. The first gives him the right to impose what royalties he may feel disposed upon new leases or on the expiration of a lease he may close the mine altogether, and thus deprive the lessees of the benefits which they have justly merited, and deprive perhaps a thousand persons of their means of bread, and were they all to insist on their rights every mine in the kingdom might be closed, and the tens of thousands of industrious and honest men engaged in the industries of mining and its concomitant branches left without employment, and the great source of the nation's revenue be entirely shut up. From a legal standpoint no one can dispute this right, but there is another law which is far more binding, without the exercise of which society could not long exist; that is the law written upon our moral nature.

One of the speakers at the meeting of the Mining Institute of Cornwall advocated the power of moral suasion, which, no doubt, in some instances would be very effective; but it may be feared in many instances, such attempts would result in a miserable failure. Everyone knows that in order to exert any force there must be an agreement between the agents employed for that purpose and the objects to be acted upon. Is it a chemical force? There must be an inherent affinity between the elements brought into contact. Is it a magnetic force? There must exist in the body to be attracted some special quality to make it attractive. Is it a physical force? The object on which the force is to be spent must have a physically yielding nature. Or is it a moral force? It can be effective only on a moral consciousness. It must be, therefore, quite clear that until you can impress the landlord with a deep moral conviction that the minerals hidden in his land are not his, and were not formed there for his benefit any more than for the benefit of others. You may as well think to dissolve adamant with water, or attract iron by wood, or beat down Gibraltar with a pistol, as to think that moral suasion will cause them to give to the miner his moral right. That landlords in general have no such moral conviction is quite evident from the manner in which they act towards the miner. Heavy dues are insisted upon notwithstanding the constant pleading, the result of which is the mines, with the present low price of metals, cannot hold out, and they succumb under the pressure, and scores of families living on and about their own estates literally starve for want of employment. In some cases those employees with their families have been compelled to leave their homes to seek employment in some other quarter, using the money which is due to the shopkeeper for that purpose, and the villages or small town wherein they lived being almost depopulated the poor tradesman must eke out his life the best he can. In all this the landlord shows no pity, and says he can only grant his lease on such and such terms.

And he is quite as heartless with the unfortunate shareholders by whom and from whom he has received yearly large sums of money, and although by a reasonable reduction in his dues he could enable the unfortunates to recoup their losses he adheres tenaciously to his selfishness and would rather see the shareholder ruined, and the miner and his wife and children starve than give up any part of that to which he can have no moral claim. I am fully persuaded that nothing less than legislation on this question can put matters on a satisfactory basis, and it is to be hoped that the agitation having begun will not cease to go on until such measures are passed as shall restore confidence in this important branch of the nation's industry.

Carnarvon, May 19. CYMRO.

KIT HILL, AND THE NEIGHBOURHOOD.

SIR,—I have read the very interesting letter from "H. R." in last week's Journal. He refers therein to the group of mines in the neighbourhood of Kit Hill and opposite the celebrated Devon Consols; and I am able, from personal experience, to confirm the favourable opinion he expresses regarding these mines. During my tour last autumn in Cornwall I made my way to the pleasant little village of Latchley, near Gunnislake, with the intention of inspecting the mines in the vicinity. Many of the properties I visited are too well known to need description, and I will confine my remarks, therefore, to the Wheal Benny sett of which "H. R." speaks in such eulogistic terms. A shaft has been sunk here some 30 fms., and an adit driven from the bank of the river, about 700 ft., into the hill until it intersects the Benny lode. Several hundred tons of splendid tin ore and arsenical mundic have already been brought to the mouth of the adit, and I was informed that samples of this ore had been found on analysis to average over 30 per cent. of arsenic, while several samples were found equally rich in tin. That this lode, which has not been sunk on at present below the adit level, is a singularly rich one, there can be no doubt; and as there are two brooks running through the property the mine can be thoroughly developed and worked at a very moderate cost. There seems indeed good reason to hope that under skilful management and with sufficient capital the Wheal Benny may prove a second Devon Great Consols, many of the lodes of which run through the sett.—*Lee, May* 23. S.

GOLD MINING, AND ITS MANAGEMENT—No. V.

By THOMAS CORNISH, M.E. (late of Australia).

Author of "Gold Mining: its Results and its Requirements." "Our Gold Supply: its effects on Finance, Trade, Commerce, and Industries, &c."

When the profits of a mine have to come from off the point of the pick and drill it is, of course, highly essential that they should not only be well sharpened, but pointed in the right direction, and that as many should be kept at work as can conveniently and economically be done.

The designing and laying out of mining work requires not only thoughtful consideration of future contingencies, which should be provided for, but a blunder once made at the outset, and perpetuated in can only at great loss of time and money be ever retrieved; or the failing to take advantage of the opportunities as they present themselves is attended also with similar loss. Gold mining, whether from deep alluvial leads, quartz reefs, or placer mining, especially in new districts, where the geological formations, the depths and strata have not been fully proved, requires to be entered into with care and judgment, or else it is easy to run into an extravagant waste of time and money for little purpose.

There is probably no other industry in which so much money can be quickly and irretrievably wasted through ignorance and extravagance as there can be and has been in attempts at gold mining. In Australia some years since I gave it as an estimate that 50 per cent. of all the labour and capital spent in gold mining had been wasted or misapplied, partly through bad mining laws, and partly through want of a better system of organisation and intelligent direction, or from want of adequate appliances to overcome difficulties that had to be encountered. The latter was most frequently the cause of much loss of time and capital in the days of the pioneer gold mining in the Ballarat district.

It was only after years of labour in the sinking of deep shafts through successive layers of basaltic rock and fine gravel drifts that it was possible to form an estimate of the difficulties to be overcome, or the appliances that it would be necessary to provide to meet them with success and expedition. As an instance of prospective difficulties that has had to be encountered in Australian mining, especially on the deep alluvial leads, I will mention one that I was associated with, having inaugurated it in 1858, and was manager of the company for about six years—that was the Durham Gold Mining Company, now and lately known as the City of Ballarat Gold Mining Company. The prospecting company who discovered the Swamp Lead (so named because of its contiguity to the then known Ballarat Swamp, now Lake Wendouree) bottomed their shaft in the gutter at about 100 ft. in depth by hand labour, obtaining an excellent prospect of about 1 oz. of gold to the tub of dirt. Taking advantage of early information of this rich discovery, I at once secured the largest area of ground that could be obtained on the course of the lead under the then bye-laws. I and my co-partners having machinery (the second engine and pumps brought on the gold fields—engine 12-horse power, pumps 6 in. in diameter) arranged with a party who had a shaft sunk in the rock to water level to supply the machinery at our command, fully believing that a few months would enable us to bottom the shaft with highly satisfactory results. A few feet further sinking the water increased so rapidly that the pumps were proved too small; these were then exchanged for larger ones. In a little while the engine was found too small, that necessitated providing capital to procure a larger engine, and when it was erected it was soon found, as the shaft got deeper, that larger pumps were again required. We then put in 12-in. pumps, so that instead of bottoming the shaft, as was first anticipated, in about two months, we were over two years pumping before we could get through the rock and drift, the whole of the drift sand was pumped with the water, which wore out the buckets and clacks so fast that they required changing nearly every day, the water rising so rapidly in the shaft necessitated lifting the whole column of pumps about 50 ft. to give the necessary time to charge the buckets. For months no man could work in the bottom of the shaft. After the water had somewhat abated, and the shaft was sunk through on to a bed of clay, to form a foundation from which to timber up and puddle back the water from, it was hoped our difficulties were ended; but, unfortunately, it was not so, for no sooner had the work of puddling back the water been accomplished than the pressure of water accumulated with such force that it burst up the clay bottom of the shaft, and at once ruined all our previous work. *Nil desperandum.* Over two years' work and expenses gone for nothing but dearly-bought experience. The next thing was the company had to be reorganised, more capital to be raised, a new shaft further ahead to be started, and machinery and plant all to be removed. The sinking of the new shaft, 9 ft. by 3 ft. 6 in., nearly 300 ft., and the construction of reef drives to cut the gutters at two different points, took upwards of three years more, when it was discovered that in consequence of the rapid dip of the gutter from 5 to 7 ft. to 100, that only a small section of it would be able to be worked to advantage.

Then arose a question, the difficulty of which I had endeavoured to provide against, by securing additional territory for mining on and under, and that was the immediate sinking another shaft on the course of the lead about a mile further out west, so as to work back up the gutter, instead of following it downwards. I strongly advised the sinking of the new shaft, but the directors objected, and I sold out; the consequence was, they sunk the shaft deeper, and carried a deep level under the course of the gutter for about three-quarters of a mile, with rises to work out the gutter. This, of course, was working to great disadvantage in cost of time and money, and, when the levels were run out, they then had to do what I had advised some 15 years previously; but, then, all that time and much money had been wasted which might have been devoted to more profitable account. It was a great blunder, which, once entered on, was perpetuated by force of circumstances, and the shareholders have had to pay dearly for the folly of those who ignored my advice in that particular instance, now 20 years since. The City of Ballarat Company is the largest and most important alluvial gold mine now in Ballarat—the work well done and the company economically and well managed; but they have had many unforeseen difficulties to encounter. The shaft is opened at 550 ft., the company owns an immense area of ground to work, but have an enormous quantity of water to drain, as might be imagined when it takes two columns of pumps (one 18 in. diameter and the other 14 in. diameter) to keep the water out. I sincerely trust that future results will be commensurate with the time and costs in developing such an undertaking. When the result of gold mining depends so much upon good or bad management, in the expenditure of capital and labour, it is surprising that so much of its development should be placed in the hands of inexperienced persons, whose incapacity not only brings discredit upon the mining interest generally, but retards the development of most legitimate and highly profitable industry.

It is not merely that money is wasted in useless labour and appliances in or about a mine, and experimenting at the shareholders' expense, but directors are too often at fault in selecting such inexperienced mining managers and indulging in such extravagant official expenses, out of all proportion to the work done, and shareholders are too apt to condone glaring irregularities, blunders, and extravagance rather than expose such errors and alter the system of management they have been indulging in, for fear of affecting the market value of shares. No greater mistake can be made by shareholders endeavouring to gloss over any blunders or mistakes, and perpetuating them still further, as has been lately done in so many cases.

When it is determined to go into mining it should be done properly—to work economically it should be done expeditiously—and not dawdle over the work and spending more money in superintendence than is expended in labour in the mine. Such blundering as this can never pay, no matter how rich the mine may be.

THE MINERAL RESOURCES OF COLOMBIA.

The Notes on the Central Provinces of Colombia, recently read before the Geographical Society by Mr. R. B. White, contain a large amount of information interesting not only to the shareholders in the Frontino and Bolivia Company but to all who have capital embarked in Colombian enterprise. He explains that the branching of the Andes cordillera into three ranges near the southern frontier of Colombia causes the rivers of this country to follow various directions instead of the east to west course which is general all along the western slope of the Andes from Chili northwards. Volcanic action has also produced vast and elevated table lands, and altered the direction of the Cauca and Patia rivers. The distinguished geologists, Drs. Alfons Stübel and Wilhelm Reiss, who have spent so many years in investigating the structure of the Andes, directed my attention to this unexplored part of Colombia, which they were themselves unable to visit. To the northward of the Herveo centre there is a repetition of the same development of elevated table lands which are found round the great volcanic centre of Pasto, but on a larger scale. They extend throughout the principal part of the State of Antioquia, and as far as the junction of the Rivers Nechi and Porce. The igneous rocks which from time to time have burst up upon the flank of the original volcanic centre are syenitic granite, porphyries, basalts, and trachytes. Naturally, in such a large extent of country, many fractures were produced by the movements accompanying these eruptions, and these fractures now mark the courses of the principal rivers of the country.

The State of Antioquia, therefore, although it may be generally looked upon as a great table land, is broken up by some very deep valleys. That of the River Arma is 5000 ft. in depth, and marks the line of a great east and west fracture, and the River Porce, which runs in a valley even deeper than the preceding, follows a north and south line. The general elevation of most of the country in Antioquia is 6000 ft. above the sea, and it may be considered as the highlands of this part of Colombia. A great deal of information has been published respecting the lower Atrato, particularly in connection with projected inter-oceanic canals. The upper portions of this great valley, with their relatively healthy climate and fertile lands, are accessible by steamer from the Atlantic Ocean, and can also be easily placed in communication with the interior and more populated parts of Colombia. The River Atrato at Quibdó is 250 yards wide and 12 ft. deep in ordinary seasons, and small steamers can go up to Lloró. The greater part of the land in the basin of the Atrato from Quibdó upwards may be said to be simply hilly, not mountainous, and generally well adapted for agriculture. There are few clearings, and the virgin forest which covers the greater portion abounds in valuable produce. The course of the upper Atrato was first surveyed by me, and it had been previously believed that the river took a more direct course from the cordillera down to the main valley. Promising copper lodes exist near Quibdó, and coal is met with in several places. The Atrato itself and all the tributary streams are rich in alluvial gold, which is of very high standard. That of the River Neguá is of 23½ carats. Previous to the Spanish conquest there must have been a considerable native population, as wherever the forests in this region have been explored, extensive Indian cemeteries and sites of towns and villages are met with in great number; so much so, that on the mountain ridge which terminates at Quibdó these ancient remains are so abundant that one would almost think that a continuous line of villages existed here.

At first sight the enormous trees in these dense forests would lead one to suppose that they must be of immense age: but a comparison with the vegetation which has sprung up on what are undoubtedly old Spanish mine workings dating no further back than the year 1600, convinces one that the greater part of these forests are not more than 200 or 300 years old, and probably at the time of the Spanish conquest there must have existed here vast tracts of open country, filled with an Indian population occupying themselves in agriculture and general industry. At present there is only a bad mule track from Quibdó, on the Atrato to Bolivar, but there are no obstacles to the construction of a good road or even of a railroad. A scheme has been already sketched out by Mr. Francisco Javier Cisneros, C.E., for a railroad which, traversing the whole of the valley of the Patia and that of the River Cauca, would communicate with the Atrato *via* Quibdó. An inter-oceanic communication would thus be formed which would afford facilities for the whole of the interior trade of the country to be carried on with the ports on either ocean. At the present time the Atrato valley has a population of 40,000, of which one-fourth are whites, and three-fourths half-caste negroes. The white population are principally engaged in importing such few articles as are necessary for clothing and general purposes amongst

this very plain living people, and they purchase the gold which is obtained by the negro washers at a considerable profit, and export it to pay for the articles which they import. The negroes occupy themselves in the collection of caoutchouc, ivory nuts, sarsaparilla, and a few other natural products, and also in gold washing on a small scale, principally by streaming.

In the northern part of the State of Antioquia, the River Cauca, before joining the Magdalena, receives the waters of the Nechí and the Porce. These rivers and the extensive region surrounding their junction are of great interest. Ranges of low hills dying away in extensive plains, which are not, however, as a rule, swampy, are the characteristics of this district. The climate is hot, but not unhealthy in the sense in which the term is usually applied to hot and low-lying tropical districts. The lazy negro race of the coast has no tendency to spread inland, and the mountaineer from Antioquia has no liking for a hot climate. The Spaniards found this region was called Zenufaná, or "Land of Gold." A great Indian road, probably connecting Bogotá, the capital of the Zipa, with the Zenú and Darien kingdoms, and ultimately with Central America, traversed the country. The first Spanish "conquistadores" found immense wealth amongst the Indians, who must have been very numerous. The Indians worked the gold mines, both alluvial and quartz, with which the whole country abounds, and they continued to work them under the direction of the Spaniards. The greater part appear to have been of a low grade of civilisation, but the artistic work in gold and pottery which is found in some parts would seem to indicate that the majority of the tribes were more or less savage tributaries of more advanced races.

The Frontino and Bolivia, and one or two other English companies, are working gold quartz mines in this region with good results. Other mines, both alluvial and quartz, are worked in a rude way by the natives, and the total produce amounts to about 70,000 ozs. per annum. Coal is abundant on the banks of the Nechí and Cauca, and the seams are favourably placed for working. Of the population of the State of Antioquia about 15,000 are professionally engaged in gold mining, and the agricultural produce obtained by the hard labour of the rest of the inhabitants only just suffices for their wants. The Spaniards attempted to colonise this part after having successfully entered the country *viz* the Darien and the Sinú, but their early colonies were destroyed by the Indians, and amongst them the first city of Santa Fé de Antioquia, which was afterwards rebuilt where it now stands.

The enormous riches of this region are matters of history. The head waters of the Rivers San Jorge, Sinú, Leon, and Rio Sucio run through an elevated country, fertile and healthy. The San Juan valley is to the south province of the Chocó what the Atrato is to the north. The region is interesting on account of its vegetable products, and the rich alluvial gold deposits of the San Juan basin. In making a journey from Buenaventura up the San Juan to Nóvita, one meets with no evidences of civilisation. The present town of Nóvita, the capital of the Province, is quite modern; the old town, which was about two miles away, was abandoned when the slaves were set free and its rich mines could be no longer worked. The western face of the Torré Hill is a horseshoe-shaped amphitheatre which, sloping down in the first place from the head of the mountain for a distance of half a mile or so, terminates in an abrupt precipice, also of a semicircular form, over which hundreds of streams, which collect their waters on the upper slopes of the hill fall in silver threads to a sheer depth of over 3000 ft., and collect together at the bottom, forming the River Surama, whose sources have been previously incorrectly marked as being on the eastern flank of the Torrá mountain. Nearly the whole of the distance traversed from Nóvita, as well as the mountain itself, abounded in auriferous quartz lodes, and the greater part of the streams showed prospects of gold in the alluviums. Much of the country, at an elevation of 3000 to 4000 ft. above the sea, is healthy and suitable for agriculture; and the schistose rocks, which are its principal characteristic, are not by any means unfavourable to the fertility of the soil. It would be quite practicable to open road communication with the River Tamaná, and if sufficient capital were employed an important mining centre, assisted by agricultural establishments for the supply of provisions, might here be formed.

A very large proportion of the platinum produced in the world is obtained from the upper San Juan. If the workings were systematically carried on a much larger quantity might be extracted. Its price in Nóvita is about 12s. per oz. troy. The bed of the River San Juan and its principal tributaries must contain a large quantity of gold. Concessions have recently been granted for working these rivers, and Mr. White has no doubt that success will attend the operations if properly and practically carried out. The Patia is the only river north of the line which, after traversing extensive valleys to the east (or inside of) the western cordillera of the Andes, breaks through this mountain range and finds its way to the Pacific. The River Cauca, which takes its rise in the same mountain as the Patia, flows directly northward, and empties itself into the Atlantic between the central and the western cordillera. The Patia, after flowing southwards for 120 miles, turns abruptly to the west, and seeks the Pacific, cleaving a mountain chain which towers to a height of 10,000 to 12,000 ft. on either side of the gorge through which the river has forced its passage, and which, up to within a mile or two of the spot, gives no sign on either hand that it would allow of such a liberty being taken with it. This peculiarity in its course gives great importance to the Patia valley. It offers a route by which the great valleys and table lands of the interior may be easily reached from the Pacific Coast. It also presents a blending of climate from the coast to the interior which is nowhere else to be found.

The strait of Minamá is in itself quite a remarkable feature in the Patia valley. The River Patia at this point drains a wide area of country, and receives an abundant supply of water from the snowy ranges of the central Andes; its volume is many times greater than that of the Thames at Richmond. The river, before entering the strait, comes to rest in an immense pool surrounded by cliffs of slate rock, from which it finds an exit through a cleft which is not more than 12 ft. wide, and through which the water moves with a barely perceptible current. This fissure, therefore, must be of great depth. Coal of excellent quality is abundant throughout the upper Patia valley. Copper mines are found near San Pablo. The River Patia itself is rich in gold, and in the dry season the negroes wash out a considerable quantity. The route by which travellers usually enter the country is by way of the port of Barranquilla, at the mouth of the Magdalena river. Steamers run up the river as far as Honda, and at Nare the road to the interior of Antioquia branches off. Five days' journey from Nare on mule back brings the traveller to Medellin, and this route is certainly the right one to follow if the State of Antioquia is to be visited. A railway is in course of construction by Mr. Cisneros from Puerto Berrio on the Magdalena to Medellin, but only about 30 miles have been opened, and the rest of the route is traversed by a mule road about as long as that from Nare. The port of Buenaventura, on the Pacific Coast, is called at twice a month by the English steamers from Panamá. A good mule road leads from the port to Cali, in the Cauca valley, and a railroad is being constructed, also by Mr. Cisneros, following more or less the same line. From Buenaventura to Córdoba, a distance of 12 miles, the railway is now open, and at the latter place mules have to be hired. A day and a half's riding brings one to Cali, and from this city any part of the State of Cauca may be reached by mule roads.

In estimating the practical importance of those districts of Colombia, of which Mr. White's paper treats, it should be borne in mind that Colombia is, with the exception of Chili, the best governed of the South American republics. Property is thoroughly respected, the laws are fairly administered, foreigners are welcomed and protected, and every inducement is held out to attract foreign capital. The trade of this country has been confined, through peculiar circumstances to particular channels, and it is really surprising that so much of its produce, particularly of gold and silver, should be imported monthly into England without the general public being aware of it. The natives generally are very unwilling to try new experiments with respect to the agents and channels which they employ for transacting their business with Europe; and thus, although the country attracted considerable attention immediately after it had gained its independence from the Spanish rule, no enterprises of any moment were undertaken by Europeans, owing principally to the jealousy with which pre-existing interests were guarded. These remarks do not apply, of course, to the Government of the country, which has always been ready to afford every facility for the introduction of foreign capital and foreign labour, recognising as it does the requirements of the country in these respects. The interest in the paper was much enhanced by the admirable collection of specimens of the minerals of the country which the author had placed on the table. They consisted of gold and silver ores, principally from Antioquia, coal from the Patia, the Cauca, and the Nechí valleys, copper ores from the Atrato and Cauca valleys, and lead, zinc, mercury, and manganese.

INDIAN GOLD MINING, AND ITS PROSPECTS—No. V.

QUARTZ OUTCROPS OF TRAVANCORE.

By J. MACDONALD CAMERON, Fel. Inst. Chem., F.C.S., &c.
(Late Assistant Chemical Laboratories, Royal School of Mines).

When I landed at the port of Colachel on my way to the hill country I made arrangements with Messrs. Henderson and Lumsden, two of the principal officials of the Scottish Indian Coffee Company, or utilising some of the machinery at the coffee mills for crushing any samples of quartz which might be sent them by me. Mr. Lumsden, who is a practical engineer, adapted to this end the spiked wheel which is used in the company's mill for crushing bones for manurial purposes. He, besides, constructed of laterite, the reddish clayey material already alluded to as being so prevalent in the low country of the Wynaad and also in Travancore, a temporary kiln for roasting the samples, as well as an excellent apparatus for washing the crushed quartz and saving the tailings. The kiln had a side aperture to admit a current of air, and was hollowed out in the centre to receive its charge, which consisted of lumps of quartz mixed with charcoal and the dry refuse parchment of the coffee beans cured at the mills. The whole was then set on fire, and as the parchment is usually perfectly dry and hence easily lighted, it soon reached a low red heat. This operation usually lasted for upwards of half an hour or so, and when the stone was thought to have been sufficiently acted upon by the fire to make it easily friable it was removed to the crushing apparatus.

Successive quantities of quarts were treated in this manner until sufficient was obtained to represent a fair average of the sample received from each estate. It is well known to those who take an interest in questions relative to the extraction of gold from quartz, that grave doubts have been thrown on the utility of roasting the auriferous stone prior to crushing. When the precious metal is present in the free state no objections can be raised to the roasting operation previous to stamping. On the contrary, it lessens the work which the stamps have to perform, but when the metal is associated with pyritous material lower sulphides are formed of a more stable nature than those originally present in the quartz matrix which hold the particles of gold in their grasp; and further, should alkaline compounds happen to be present they become fused at the temperature necessary to render the quartz friable, and forming fluxes which hold the gold in suspension, thus preventing the mercury from forming an amalgam with it. (See Art. I., *Mining Journal*, p. 509, for Mr. Gowan's Australian experience.)

Mr. Brough-Smyth, who made an examination of slags formed in the operation of quartz roasting at several of the Wynaad mines, found microscopical particles of gold enclosed by them which could not possibly be extracted during the process of amalgamation, and were consequently lost. This objection would not, however, obtain in the roasting of the samples referred to, as no alkaline fluxes were used, and the temperature was not sufficiently high to melt any felspathic compounds which may have accompanied the quartz. The stone from several of the estates examined showed small quantities of gold on treatment with mercury. These estates were Retreat, Ballochbuie, Strathmore, and Invernettie, but the yield from the latter was scarcely more than a trace. Selected samples from the more promising portions of the Invernettie outcrops were to have been dispatched to England for assay; but I have not up to the present received them.

Whilst what may be called the gold fever was at its height, and speculation rife in regard to the purchase of land in the Wynaad and Mysore districts, it was but reasonable that the attention of the Travancore Government should be directed to the desirability of ascertaining whether there were sufficient grounds for encouraging a hope that gold might be found in their country when its close proximity to the Wynaad and Neilgiris is considered. To this end the Sircar secured from the Madras Government the services of Mr. William King, deputy-superintendent of the Geological Survey of India, and in January, 1881, he made a cursory survey of some portions of the country. As Mr. King has been engaged during the greater portion of his professional career on the Indian Survey, and as he is its second officer, any opinion he may express in regard to geological matters is stamped with that authority which must always be associated with long experience and professional distinction. Moreover, I understand Mr. King was entrusted by the Madras Government with the task of making an examination of the auriferous districts of the Wynaad and Mysore prior to Mr. Brough-Smyth's visit in 1878, and the particular experience which that work furnished him with enhances the value of his opinion in regard to what he observed in those portions of Travancore which he visited. Although I feel that it would be nothing short of presumption on my part were I to suggest that my opinions and observations should be accepted as superior to his, yet in cases where I consider Mr. King may have overlooked a fact, or where there are evidences of hasty conclusions, he will, I am sure, forgive my alluding to them. To enable me to do this, as well as to place before those interested in the work upon which I was engaged in Travancore all available information relating to it, I shall quote Mr. King's report, and to afford my readers a more ready reference to its several paragraphs I have taken the liberty of numbering them consecutively. As will be noticed, the report refers especially to Peermerd district, the northernmost district of Travancore:—

Mr. King's report.—1. "I have the honour to report for the information of the Travancore Government as follows, on the gold-bearing qualities of the quartz outcrops of Peermerd and the adjacent country.

2. In the first place, and without further preamble, these outcrops of quartz are not reefs as usually understood, but are true beds of quartz rock lying between and running with other beds of the country rock which is of the gneiss or crystalline series. Reefs or veins of quartz generally run across the country rock as in Wynaad or in the Kolar region of Mysore. Secondly, the size of the outcrops is small, only one of them being sufficiently large to allow any expectations of what might be called a large tonnage of stone. Thirdly, and most important of all, the quartz of the outcrops, though it shows on a close assay traces of gold, is certainly not rich enough to be called auriferous quartz in the usual acceptation of the term.

3. I have now also seen sufficient of the country to the west as far as the sea-coast, eastward for some distance down the Gudalier Ghaut, and southwards to the road between Kurtallum and Trevandrum, to be able to give much the same opinion of its auriferousness as I do of the Peermerd range. There then only remains the northern portion of Travancore, more particularly the hilly part of what is called the high ranges, which might, as being nearer the Neilgiri and Wainad country, possibly possess auriferous reefs. However I have been on a portion of the Annamalais, and did not notice any reefs there, so that I am not particularly hopeful that the northern region will be found more promising. I have been unable to examine any portion of Southern Travancore; but I understand an expert (myself) is now visiting that region under the auspices of the Scottish India Coffee Company, and from him doubtless a trustworthy report as to the auriferousness of that part of the country will be obtained. I may, however, state from what I saw of the country between Kurtallum and Trevandrum that the rocks crossed on that traverse are ranging away to the south-eastward very much of the same kind, and in the same way as they range north-westward, and that probably quartz outcrops of the same kind will be found to the south-east.

4. Above all it must be remembered that there appears to be no evidence of any old gold workings or washings in the hilly regions of Travancore; and this was a point I had always before me in my consideration of the Peermerd region. Only lately a map of the gold regions of South India has been issued by Messrs. Wyld and Co., of London, in which some serious errors as to the range of gold reefs have been allowed to be laid down, with one error of omission, and among them is the illustration of Travancore as a gold-bearing country. How this information could have been obtained I know not, but the facts of the case are entirely against such delineation on the map.

5. As a commencement for my examination of Peermerd, I was shown (by Mr. Rohde, the commercial agent to the Travancore Government at Alleppey) some large pieces of quartz rock which had been sent down from the Peermerd hills; but these made me at once doubtful as to their being reef quartz, while I could not notice any visible gold in them. The rock is really a compound of quartz and felspar—the latter mineral being certainly very thinly distributed through the mass—and not a pure quartz as is usually the case with the vein rock. At the same time I could only doubt, for the specimens might after all be from the edge of a reef where a mineral such as felspar sometimes does occur.

6. On the route from Kotayam to Peermerd, which is as being across the strike or run of the rocks of the country, a capital line of observation as to the behaviour of any quartz associated with these rocks, I had plenty of opportunity for seeing that the quartz which does occur is running with the gneiss, is, in fact, part and parcel of the gneiss series, instead of, as it ought to be if it were reef or vein quartz, a subsequent formation quite independent of and foreign to country rock.

7. The first good outcrop in the Peermerd range occurs at about the fortieth mile near the top of the ghaut below Mr. Probyn's estate, but this is merely a seam or thin bed of quartz rock largely made up of felspar. It is striking or ranging N.N.W., S.S.E., and is dipping at a high angle sometimes to the eastward, at other times to the westward. I subsequently ascertained that this is a southerly prolongation of a much larger outcrop on the west slope of the Amberamullay Hill, to which I shall again refer further on.

8. The country rock of the Peermerd range is essentially a very quartzose form of gneiss, and hence it is not extraordinary that beds of more or less pure quartz rock should occur. There is also a good deal of very massive dark coloured hornblendic rock, which, owing to the flat lie of the beds in some places, gives an exaggerated idea of its preponderance over the more quartzose and lighter coloured forms of the gneiss. Indeed the very light coloured and friable soils of Peermerd, and the darker coloured soils of the Peryaur are the necessary results of the degradation of such a style of rocks.

9. These forms of gneiss are remarkably well bedded, much more so than is usual with so highly altered or metamorphosed a series, and thus the strike or range of the beds is very clear from N.N.W. to S.S.E., while their dip is just as plain, first of all on the western edge of the hills nearly vertical, and then going eastward, assuming a gradually lower angle to the eastward. They become nearly flat in the middle of the range, then rise up rather, and again roll down into the Peryaur valley, beyond which the easterly dip is preserved right into the Cumbum valley.

10. Now there is no doubt that the outcrops of quartz, or quartz rock as it properly is—are running with the strike and dip of these beds. In the first place there is the strong seams or bed of the Amberamullay Hill. It comes to the surface at 400 yards down the western slope below the trigonometrical station, and was there pointed out to me by Mr. Samuel Baker, and under his guidance I was able to see it running away down the southern valley, and so across to Probyns' estate on the Ghaut. To the northwards we found it running down to the Bison Valley estate, where I think it is much broken, or thins out frequently in crossing that estate before it appears again in the Ibex ledges away further to the northwards. It lies nearly vertical in the Amberamullay, is about 10 ft. thick in places, but thins out a good deal, and may be on the average about 2 ft. thick. There is thus a very large amount of stone in this hill sufficiently large indeed to warrant its being broken up, if it were only a reef of quartz, and above all auriferous."

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BISMUTH BRONZE.—An improved metallic alloy, which is suitable for use in sea water, for telegraph and music wires, and for various other purposes, has been invented by Mr. JAMES WEBSTER, of Solihull, Warwick. In the first place, he takes by weight 1 part of bismuth and 16 parts of tin=17 parts; and melts and well mixes and combines them in a suitable vessel for a separate or preliminary alloy. For the hard bismuth bronze he takes—69 parts of copper, 21 parts of spelter, 9 parts of nickel, and 1 part of the above alloy of bismuth and tin=100 parts. He melts the metals in a suitable furnace or crucible, and during the process thoroughly mixes and combines them, and then while in the molten state runs the alloy thus produced into moulds of any convenient shape or form, for future use or sale, as required. The bismuth bronze is a hard, tough, and sonorous metallic alloy, which he, by preference, uses in the manufacture of ships' screw-propeller blades, shafts, tubes, and other ap-

pliances employed partially or constantly in sea water, it being specially prepared and suited to withstand the destructive action of the hydrochloric acid of salt water. In consequence of its toughness it is well suited for telegraph wires, and other similar purposes where much strain has to be borne by its wires. From its sonorous quality it is well adapted for piano and other music wires; also for any similar purposes to the preceding. For domestic utensils and other articles, generally exposed to atmospheric influence, he prefers to slightly vary the previous composition; thus he first takes 1 part of bismuth, 1 part of aluminium, and 15 parts of tin=17 parts for the separate or preliminary alloy. For the latter generally useful bismuth bronze he takes 69 parts of copper, 21 parts of spelter, 9 parts of nickel, and 1 part of the said alloy of bismuth, aluminium, and tin=100 parts, as before. These metals are melted, mixed, and generally treated as previously described for the hard sea water bronze, and form a durable, bright, and hard bronze or metallic alloy suited for the manufacture of domestic spoons, forks, knives, dish covers, hot-water dishes and plates, kettles, teapots, jugs, mugs, cups chamber ware, cans, lamps, candlesticks, and numerous other utensils or articles exposed to atmospheric influence. These alloys will resist oxidation, polish well and easily, and keep their colour well

ROTARY PUMPS AND BLOWERS.

Probably few descriptions of blower are more widely known than that in which two or more rotating abutments or pistons co-act with each other and with the shell so as to prevent the backward escapement of air or water, and Mr. F. M. ROOTS, of Connorsville, U.S., has recently patented some further improvements with a view to produce pistons capable of sustaining a heavy pressure with the least possible friction between the abutting parts and to ensure perfect contact between the abutments during their entire revolutions. It also consists in certain novel features of construction by which the effectiveness of the machine is increased and its interior working parts protected from sediment or heavy foreign substances. In his patent of September, 1881, Mr. Roots describes a method of producing pistons which ensures perfect contact between them during their entire revolution. The centres from which the arcs and contact points are described are in an inscribed circle of about 1-12th less diameter than the pitch circle. Pistons so constructed answer every purpose for a blower or other engine in which the required pressure is usually about 1 or 2 lbs. per square inch, and never exceeds 5 lbs., but in pumps to be used for fire purposes the pressure ranges from 100 to 150 lbs. per square inch. It is, therefore, necessary in this class of machines that the size of the shafts be increased, and that the thickness of metal around the shaft should not be less in any part than one-half the diameter of the shaft. To obtain these results the abutments must necessarily be contracted in the direction of their major axis, and correspondingly widened in the direction of their minor axis. The method which he described in 1881 will not produce such pistons because the describing centres are too far from the axis of rotation. When the centres from which the abutting surfaces are described are brought out near to the axis, as they must be to produce these heavier pistons, he has found that the abutments will not clear each other when the convex and concave arcs meet in curves which are arcs of equal circles, but that in order to keep up perfect contact with the least possible friction, the convex arcs must be compound curves, and must meet the concave contact surfaces in an arc of a smaller circle. He has also discovered a system for obtaining the centres from and the radius by which the smaller arcs are described. So that by his present invention he is enabled to construct pistons of any required strength.

The abutment shafts are placed the requisite distance apart, depending upon the size of the machine to be constructed. Two equal circles are described around the shaft centres, by a radius equal to one-half the distance between said centres, these pitch circles are divided by sectors into eight equal parts, one of these dividing lines passes when extended through both shaft centres. Within the pitch circle and from its centre he describes, a smaller circle which he terms the inscribed circle (about 1-16th less in diameter than the pitch circle). The difference between the diameter of this circle and the pitch circle (within certain limits) determines the strength of the abutments, the smaller the inscribed circle the heavier or thicker will be the abutments through the waist or minor axis and *vice versa*. The points from which the outer convex curves, and inner concave contact surfaces are described he obtains by taking the difference between the diameters of the inscribed and pitch circles, and then with one point of a divider in the point where the line through the shaft centres cut the inscribed circle and works therefrom. Pistons constructed with their convex arcs composed of a compound curve which he describes make a perfect machine, as the pressure forward is constant, without any backward escapement of the fluid. But he does not limit himself to the exact curve described for the smaller arcs, as these are in contact with the opposite abutments but a very short time during each revolution. Should perfect contact not be kept up during this short time it is evident that the backward escape would be so small as not to materially affect the usefulness of the machine, nor does he limit himself to the exact location of the point as these may be slightly varied and still produce a more effective machine than any other now known.

The other working portions of the pump are constructed essentially similar to that described in the patent of 1881, excepting the abutment or piston shaft are packed where they pass through the heads or ends of the case, and a receiving chamber is made separately or in the bed-plate, over which the piston or abutment case is attached, and also the suction pipe. The abutment shaft revolves in bearings attached to the ends of the casing, and the shafts are provided with gear wheels at each end of equal diameter for transmitting the power from one shaft to the other in small pumps, and to keep the abutments in proper revolving position one with the other. The pump may be worked through the medium of belts over pulleys attached to each abutment shaft, and at opposite ends of the machine, or they may be worked by applying engine-power direct or through the medium of gearing to the end of one or both abutment shafts, and arranged so that their cranks will be at right angles, or any other known means of applying power may be employed to work the machine. The abutments or pistons are usually made of cast-iron for blowing purposes, but can be made of sheet metal or steel by being shaped or stamped out in a cold or heated state to the proper form in suitable dies or forming pieces. When the abutments are thus made of sheet metal or steel it will be better to make them in half sections or pieces, and bolt and rivet them together at suitable points. The piston shafts are provided with arms or centre pieces for attaching the sheet metal abutments to them in any known convenient manner.

In some cases the packing glands are used to form bearings for the pistons or abutment shafts to work in, provision is made to prevent dirty water from the pump getting between the shaft and bearing portion of the gland; this is done by forming a groove on the inside of the gland, near its inner end, and a similar groove on the outside of the gland; opposite the one on the inside holes are made through the gland opposite the grooves, and thereby put the inside and outside groove in the gland in communication, and the groove on the outside of the gland is put in communication with an opening made through the side of the packing chamber. With the parts thus provided with grooves and openings it prevents any dirty water that may come from the pump through the packing from getting between the shaft and bearing portion of the packing gland by being drawn off from the gland through the grooves and openings, and thereby prevent cutting or injury to the shaft where it works in the gland with any foreign matter that may be in the water. The machine may be used as a hydraulic engine; for this purpose water pressure is made to revolve the pistons, and the power is taken from the abutment shaft through the medium of pulleys and belts or gear wheels; any known means of regulating and governing the flow of water to the engine may be employed for regulating its power. The pumps may be used for any purpose when it is required to lift and force fluids or semi-fluids, and may be employed as a fire-engine by supplying it with suitable shut-off valves, and constructed for ordinary use at the same time.

FOREIGN MINING AND METALLURGY.

The condition of the Belgian coal trade remains much the same, the markets being generally firm. Coke has ranged between 13s. 6d. to 14s. per ton. The movement of coal over the Belgian State Railways has continued active; thus the number of coal trucks passing over the system in the seven days ending May 15 was 17,133, as compared with 15,800 in the corresponding week of 1882, showing an increase of 1333. The German coal trade has presented scarcely any change. The deliveries made on foreign account have continued considerable, and it appears tolerably certain that a decided progress has been realised under this head; production has, however, continued upon a large scale, and this has prevented any change taking place in prices. Contracts have just been let at Cologne for 136,000 tons of locomotive coal, 3000 tons of forge coal, 5400 tons of gas coal, and 2000 tons of household coal required for the State railways of the district. The tenders submitted for the locomotive coal ranged from 5s. 6d. to 6s. 6d. per ton. The production of the Aix-la-Chapelle basin in 1882 amounted to 1,325,556 tons, as compared with 1,281,493 tons in 1881, and 1,269,607 tons in 1880. The deliveries from the basin last year were 1,302,320 tons, as compared with 1,247,757 tons in 1881, and 1,250,660 tons in 1880. It will be seen that the production increased last year to the extent of 44,062 tons, or 3·40 per cent. A slight advance has taken place in coal at Dusseldorf, but coke has given way.

There are still no symptoms of the revival in business which has been anticipated for sometime past in connection with the Belgian iron trade, orders continuing scarce irrespective of the current demand. Some orders have been received for iron for building purposes, but these orders have not produced much effect upon the Belgian market. Employment, at the same time, by no means makes default, and it is a matter of astonishment that with the scantiness of important contracts so many rolling-mills should still be occupied. It is clear that no very large orders would be required to bring about a rapid transformation in the state of affairs, but it is precisely this contingent of fresh orders which is lacking, It is stated that a contract will shortly be given out for locomotives for the Belgian State Railways, but the information obtainable upon the subject is still very vague. Quotations have scarcely varied. English pig is still maintained at 2*l.* 6s. 10d. per ton, but Charleroi casting pig maintains a quotation of 2*l.* 18s. per ton. Luxembourg casting pig has continued firm at 2*l.* 10s. per ton. Refining pig has fallen 2s. per ton. A quotation of 2*l.* 8s. per ton for hard pig is admitted for discussion. Ordinary pig has declined in consequence to 2*l.* 4s. per ton, and mixed pig to 2*l.* per ton. The pig of the Athus-Helanzy group has remained unchanged at 2*l.* 6s. per ton. A slight reduction which has taken place in the price of pig is not sufficient, however, to enable concessions to be made as regards iron. No. 1 iron has not fallen much below 5*l.* 4s. per ton, while No. 2 has been supported at 5*l.* 10s. per ton, and No. 3 at about 5*l.* 16s. per ton. Girders have been rather weak at 5*l.* 8s. per ton. No. 2 plates have been dealt in at 7*l.* per ton, No. 3 at 7*l.* 16s. per ton, and No. 4 at 11*l.* per ton. Plates of commerce have continued to be quoted at about 9*l.* 4s. per ton.

A marked heaviness continues to prevail in the French iron trade, but the question involved is mainly that of a diminution in the production. In the Longwy group, notwithstanding the rather considerable deliveries which have been made, and which exceeded in April 30,000 tons—the result being a diminution of 5000 tons in stocks—the extinction of six blast-furnaces has been decided upon. Efforts have also been made to arrive at an understanding with the proprietors of blast-furnaces now in course of construction in order to check the lighting of them when they are finished in September or October. In the Nord orders have become rather scarce, and stocks have not materially declined, so that it is now seen that the number of idle days, fixed at five for May, will have to be increased in June. Quotations have not varied materially upon the French markets, merchants' iron having made 7*l.* 4s.; plates for building purposes, 9*l.* 8s.; and boiler plates, 10*l.* 8s. per ton. Pig has been in little better demand in Germany, so that even with the reduction to which the syndicate of blast-furnace proprietors has just agreed, comparatively little new business has been done. Rolled iron has continued in fair demand, and the forges have been supplied with a good current of orders. Railway plant is scarce, and there have been numerous transactions in all accessory materials. The German steelworks have been also well employed. The general condition of the German iron trade may be said to be good, but not sufficiently so to enable an advance in prices to be made. We learn from Breslau that a convention, having for its object a restriction of the production of the blast-furnaces of Upper Silesia, will continue in vigour. From Dusseldorf we also learn that business in pig has been quiet, but that the stocks held by the blast-furnaces do not increase.

ELECTRICAL PROGRESS.—The immense progress made in New York during the past two years in the business of the United States Electric Company was referred to in a letter from Mr. de Kabath, read at the recent meeting of the Maxim-Weston Company by the Chairman (Admiral Sir E. A. Inglefield, C.B., F.R.S.), and must be particularly gratifying to the shareholders. Mr. de Kabath (May 15) said that they had that day in New York alone five central stations for the purpose of supplying light. Each station was fitted with engines of 500 horse power, and there was ample space to allow for the duplication of the plant. They had also installations in the principal buildings. His company's works at Newark, New Jersey, covered a large area, and about 1000 men were employed. Four dynamo machines were turned out daily, and they had orders for 60 days ahead. Estimating roughly, as the business was steadily increasing all the time, there were not less than 20,000 Weston arc lights in actual daily operation throughout the United States, and not less than 50,000 Maxim incandescent lamps. Mr. Weston was now actively engaged in bringing out a complete system for transmitting power by electricity. After expressing a very high opinion of the Maxim and Weston systems, and referring to the operations of his company on the Continent, Mr. de Kabath stated that he was not of the opinion which was held by some that the present difficulty of the Maxim-Weston Electric Company was to be solely attributed to bad management. He thought that the great difficulty which the company had had to encounter was insufficient capital. In conclusion, the writer maintained that the United States Electric Lighting Company had fully demonstrated that electricity could be commercially employed, and he had not the slightest doubt that it could be similarly used in Great Britain if there were adequate means, and the business were conducted with the same amount of enterprise as it had been in the United States. The resolution passed at the last meeting, increasing the nominal capital of the company to 500,000*l.* by the issue of 327,500 shares of 1*l.* each, was then submitted for confirmation. A discussion followed as to the liability of the shareholders in the event of the new shares being allotted fully paid at 5s.; and Mr. Wild (the solicitor) stated that the difficulty could be overcome legally by each of the shareholders signing an agreement to the effect that he had subscribed for the fully paid-up shares at 5s. each. The Chairman put the resolution and declared it carried, stating that the directors would not increase the capital beyond 250,000*l.* without further consulting the shareholders. The new shares would be issued at 5s., and allotted *pro rata* among the shareholders, and any balance not taken up would be offered afterwards to the public.

CORNISH PUMPING-ENGINES.—The number of pumping-engines reported for April is 15. They have consumed 1473 tons of coal, and lifted 10·1 million tons of water 10 fms. high. The average duty of the whole is, therefore, 46,400,000 lbs. lifted 1 ft. high by the consumption of 112 lbs. of coal. The following engines have exceeded the average duty:—

Dolcoath—85 in.	Millions	50·3
Mellanear—76 in.		52·0
Mellanear—Gundry's 80 in.		46·4
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West Wheal Seton—Harvey's 85 in.		63·1
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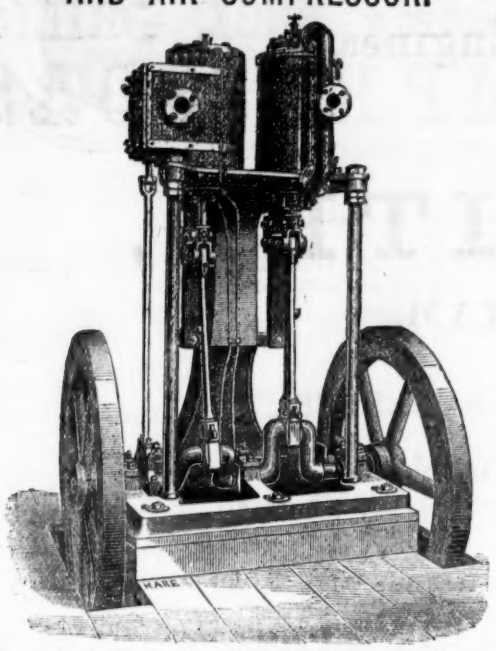

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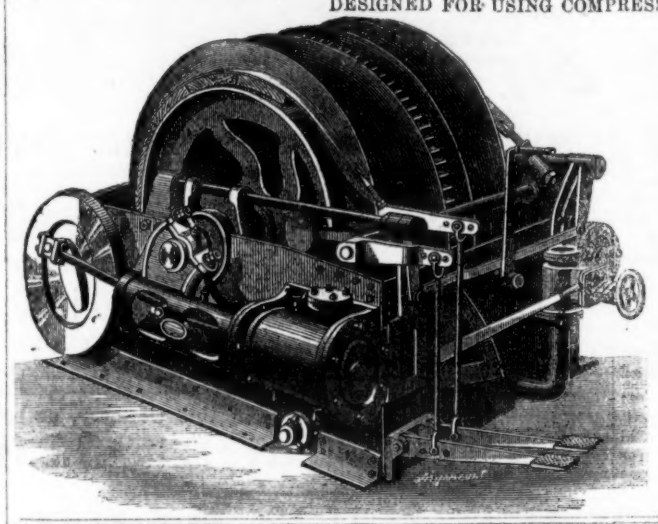

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